

FINAL REPORT

CONTRACT F61775-99-WE073

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**R&D CENTER "ATOM – ADVANCED TECHNOLOGIES
FOR OPTICAL MATERIALS"
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13. ABSTRACT (Maximum 200 words) This report results from a contract tasking Advanced Technologies for Optical Materials (ATOM) as follows: The contractor will grow and deliver a number of samples of ZnGeP2, CdGeAs2, and GaSe for characterization by AFRL/MLPO for possible use in tunable lasers in the mid- and far-IR.				
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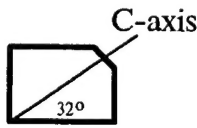
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OPTICAL ELEMENTS SPECIFICATION # 1

MATERIAL: Zinc Germanium Phosphide , doped by scandium, $\text{ZnGeP}_2\langle\text{Sc}\rangle$

ORIENTATION : $\theta = 90^\circ$; $\varphi = 0^\circ$; plane (100)

APERTURE : $10 \times 7 \text{ mm}^2$

Element #	Thickness, mm	\bar{C} -axis -direction (schematic)
1	0.92	
2	0.92	

Note: As-grown samples, without any improving annealing

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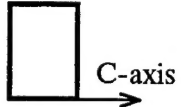
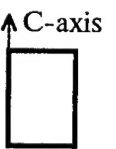
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OPTICAL ELEMENTS SPECIFICATION # 2

MATERIAL: Cadmium Germanium Arsenide, CdGeAs₂

ORIENTATION : $\theta = 90^\circ$; $\varphi = 0^\circ$; plane (100)

APERTURE : $(7 \pm 0.3) \times (5 \pm 0.3) \text{ mm}^2$

Element #	Thickness, mm	\vec{C} -axis -direction (schematic)
3	0.67	
4	0.68	
5	0.88	
6	0.78	
7	0.78	
8	0.54	
9	0.54	
10	0.55	
11	0.55	
12	0.56	
13	0.77	
14	0.82	
15	0.88	

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OPTICAL ELEMENTS SPECIFICATION # 3

MATERIAL: Cadmium Germanium Arsenide, CdGeAs_2

ORIENTATION : $\theta = 0^\circ$; $\varphi = 0^\circ$; plane (001)

APERTURE : $(6 \pm 0.3) \times (6 \pm 0.5) \text{ mm}^2$

Element #	Thickness, mm
16	0.70
17	0.70
18	0.71
19	0.69
20	0.70
21	0.75
22	0.75
23	0.61
24	0.70
25	0.67
26	0.65
27	0.55
28	0.62
29	0.62
30	0.62
31*)	0.55

*) Additional, with the aperture : $(5.6) \times (5.7) \text{ mm}^2$

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SPECIFICATION

MATERIAL

Zinc Germanium Phosphide

The bulk material is homogeneous and single domain with no striae

CUT

Type I:

Theta = 51 degrees, Phi = 0 degrees
(tolerance ± 0.5 degrees)

DIMENSIONS

APERTURE, mm \times mm

8 \times 5 (tolerance ± 0.2 mm)

LENGTH, mm

0.65 (tolerance ± 0.05 mm)

BULK ABSORPTION, cm $^{-1}$

< 0.2 (non-polarized radiation) "

< 0.02

AT WAVELENGTH, μ m

2.1

3.5-5

END SURFACES

Flatness

Lambda/6 at 633 nm

Scratch-dig

20/10 (as per MIL-0-13830 A)

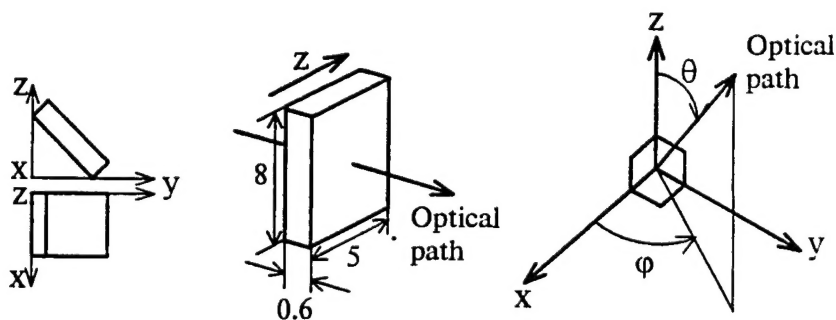
Parallelism

< 30 arc seconds

QUANTITY, pcs

20

SCHEMATIC



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GaSe-element

Operating Instruction

Attention: Gallium selenide is very soft and plastic material, therefore it is necessary to eliminate, as possible, any mechanical attacks on the element.

The scheme of the element placement in the holder.

1. The nonlinear-optical GaSe-element 1 is placed on the polished basement 2 of the holder and fixed on this basement by means of synthetic glue 3 (such as "Moment").
2. The protective plate 4 is attached to the basement 2 by means of the two screws 5.
3. In order to take out the element from the holder, first you must unscrew the two screws 5 and remove the protective plate 4. Then the holder with the element is placed into dissolver (type of acetone) and held there to the glue dissolving. Next you may remove the element carefully touching neither upper nor lower sides of the element.
4. To clean the element surface from one dust one may use a soft, for example, squirrel brush. To take scratches or other injuries of working element faces you must not apply standard mechanical polish. The optical surface is restored by splitting-out a thin material layer of whole working surface of the element with the aid of a sharp blade.

Nonlinear Optical Element SPECIFICATION

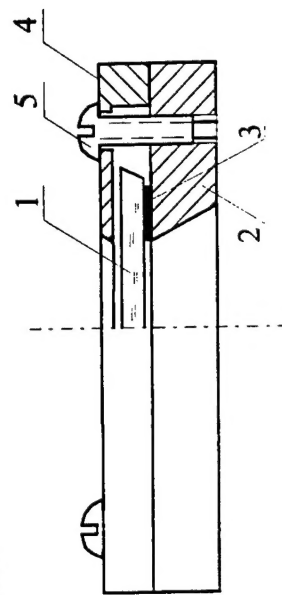
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NLO element material	Gallium Selenide GaSe	
Designation	GSB-158	
Application	Parametric Frequency Conversion for mid IR lasers	
Orientation	$\theta = 0^\circ$; x-axis direction is marked on the protective plate	
Length, mm	7,5	
Aperture, mm×mm	Ø12	
Absorption, cm ⁻¹ at wavelength, µm	<0.1 5	
AR Coating	—	

Outside view



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NLO element material	Gallium Selenide GaSe
Designation	GSB-159
Application	Parametric Frequency Conversion for mid IR lasers
Orientation	$\theta = 0^\circ$; x-axis direction is marked on the protective plate
Length, mm	
Aperture, mm×mm	Ø5
Absorption, cm ⁻¹ at wavelength, µm	< 0.1 5
AR Coating	—

Outside view

